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1) The product of matrices $(PQ)^{-1}P$ is
   a) P^{-1}
   b) Q^{-1}
   c) $P^{-1}Q^{-1}P$
   d) PQP^{-1}

2) The general solution of $\frac{d^2y}{dx^2} + y = 0$ is
   a) $y = P\cos x + Q\sin x$
   b) $y = P\cos x$
   c) $y = P\sin x$
   d) $y = P\sin^2 x$

3) A mild steel specimen is under uni-axial tensile stress. Young's modulus and yield stress for mild steel are 2×10^5 MPa and 250 MPa respectively. The maximum amount of strain energy per unit volume that can be stored in this specimen without permanent set is
   a) 156 Nmm/mm^3
   b) 15.6 Nmm/mm^3
   c) 1.56 Nmm/mm^3
   d) 0.156 Nmm/mm^3

4) A reinforced concrete structure has to be constructed along a sea coast. The minimum grade of the concrete to be used as per IS: 456-2000 is
   a) M 15
   b) M 20
   c) M 25
   d) M 30

5) In the design of a reinforced concrete beam the requirement for bond is not getting satisfied. The economical option to satisfy the requirement for bond is by
   a) bundling of bars
   b) providing smaller diameter bars more in number
   c) providing larger diameter bars more in number
   d) providing same diameter bars more in number

6) The shape of the cross-section, which has the largest shape factor, is
   a) rectangular
   b) I- section
   c) diamond
   d) solid circular

7) Group symbols assigned to silty sand and clayey sand are respectively
   a) SS and CS
   b) SM and CS
   c) SM and SC
   d) MS and CS

8) When a retaining wall moves away from the backfill, the pressure exerted on the wall is termed as

   a) passive earth pressure
   b) swelling pressure
   c) pore pressure
   d) active earth pressure

9) Compaction by vibratory roller is the best method of compaction in case of
   a) moist silty sand
   b) well graded dry sand
   c) clay of medium compressibility
   d) silt of high compressibility

10) A person standing on the bank of a canal drops a stone on the water surface. He notices that the disturbance on the water surface is not traveling upstream. This is because the flow in the canal is
   a) sub-critical
   b) super-critical
   c) steady
   d) uniform

11) A flood wave with a known inflow hydrograph is routed through a large reservior. The outflow hydrograph will have
   a) attenuated peak with reduced time-base
   b) attenuated peak with increased time-base
   c) increased peak with increased time-base
   d) increased peak with reduced time-base

12) A stable channel is to be designed for a discharge of Q m^3/s with slit factor f as per Lacey's method. The mean flow velocity (m/s) in the channel is obtained by
   a) $\left(Qf^2/140\right)^{1/6}$
   b) $(Qf/140)^{1/3}$
   c) $\left(Q^2 f^2/140\right)^{1/6}$
   d) $0.48\left(Q/f\right)^{1/3}$

13) The base width of an elementary profile of a gravity dam of height H is b. The specific gravity of the material of the dam is G and uplift pressure coefficient is K. The correct relationship for no tension at the heel is given by
   a) $\frac{b}{H} = \frac{1}{\sqrt{G\text{-}K}}$
   b) $\frac{b}{H} = \sqrt{G\text{-}K}$
   c) $\frac{b}{H} = \frac{1}{G\text{-}K}$
   d) $\frac{b}{H} = \frac{1}{K\sqrt{G\text{-}K}}$

14) Two primary air pollutants are
   a) sulphur oxide and ozone
   b) nitrogen oxide and peroxyacetylnitrate
   c) sulphur oxide and hydrocarbon
   d) ozone and peroxyacetylnitrate

15) Two biodegradable components of municipal solid waste are
   a) plastics and wood
   b) cardboard and glass
   c) leather and tin cans
   d) food wastes and garden trimmings

16) The specific gravity of paving bitumen as per IS: 73-1992 lies between
   a) 1.10 and 1.06

b) 1.06 and 1.02
c) 1.02 and 0.97
d) 0.97 and 0.92

17) A combined value of flakiness and elongation index is to be determined for a sample of aggregates. The sequence in which the two tests are conducted is
   a) elongation index test followed by flakiness index test on the whole sample
   b) flakiness index test followed by elongation index test on the whole sample
   c) flakiness index test followed by elongation index test on non-flaky aggregates
   d) elongation index test followed by flakiness index test on non-elongated aggregates